

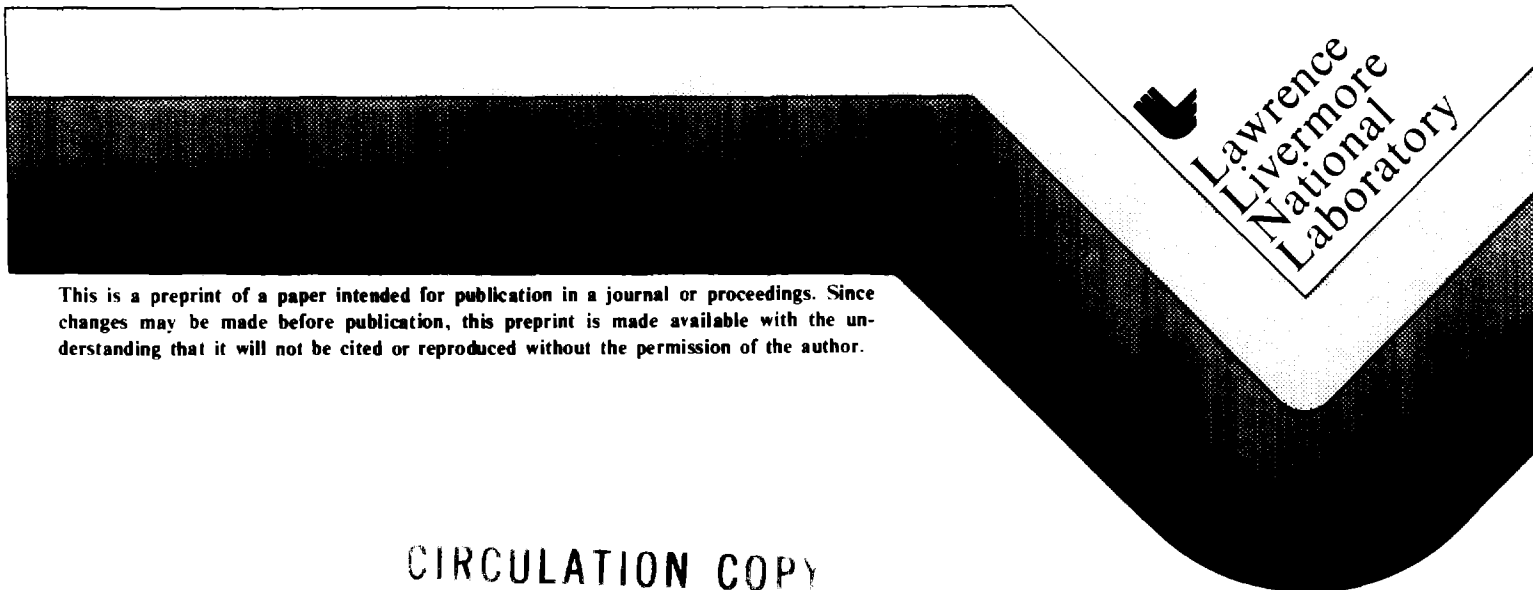
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PREPRINT

Book Review of Man-Made Carbon Dioxide and Climate Change:
A Review of Scientific Problems

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Book Review of Man-Made Carbon Dioxide and Climate Change: A Review of Scientific Problems. P. L. Liss and A. J. Crane. 1983, 127 pp. Paperbound \$7.90. Hardbound \$17. Geo Books, Regency House, 34 Duke Street, Norwich NR3 3AP, England

In the last few years there have been quite a number of reviews of the potential effects of carbon dioxide on climate. For a reader with some background in atmospheric sciences, this book, as its title suggests, provides a helpful and reasonably thorough technical review of the scientific understanding that has led to sometimes overly dramatic pronouncements of unprecedented climate changes. The authors quite thoroughly identify both the problems and uncertainties that arise when attempting to project climate changes a century or more into the future.

Both authors are affiliated with the British electrical utility, Liss with the Central Electricity Generating Board (CEGB) and Crane with the Central Electricity Research Laboratories. This review was first prepared as an internal report for CEGB, and the emphasis, especially when discussing implications of climate change, focuses primarily on the energy aspects of the issue. This affiliation with an organization that generates copious amounts of CO₂, however, seems to have encouraged a well-argued technical discussion appropriate as a resource for a knowledgeable (in terms of both physics and atmospheric jargon) rather than an attempt to downplay the issue as a means of justifying maintenance of present policies. The concluding part of the review, entitled "Implications of Increased Carbon Dioxide for the Use of Energy in the Future," encourages, for example, improved fuel use efficiency, a change to energy technologies emitting less or zero amounts of CO₂, planting of trees, and, if feasible, removal of CO₂ from emissions from fixed sources since these actions "will make a positive contribution to the solution of any CO₂-induced climate problem which is recognized in the future." Such comments seem somewhat surprising in this book since the projected climatic changes are viewed as a problem simply because the conditions may be unprecedented, not through any review of impacts and benefits. Although suggesting such changes, they expect society not to act until climate change is actually demonstrated to have occurred.

The first two parts of the book describe the understanding of the "Global Behavior of Man-Made Carbon Dioxide" (Part I) and the "Climatic Consequences of Increased Carbon Dioxide Concentrations" (Part II). The review is current as of about late 1981 (10 out of 157) references that had generally been available in draft in 1981 have been updated to 1982 and 1983). Although devoting only about forty pages and fifteen figures to each topic, almost every sentence is full of information and, for a person with a scientific curiosity, requires (and deserves) careful thought. Explanations are based on the workings of chemistry and physics, using model results

to train and support understanding rather than as a sacrosanct pronouncement of certain changes to occur. Their perspective is critical in discussing ideas and the likelihood of these ideas being correct. The reader, however, should be just as critical, because the last two years have shown that a few of what seemed like acceptable explanations are no longer so. For example, asynchronous coupling of the atmosphere and ocean is now recognized as probably inadequate for performing transient CO₂ calculations (this example exemplifies the level of understanding and technical competence required for readers of this review).

While I do not agree with all of their interpretations and was occasionally baffled by use of unreferenced numbers that seemed strangely precise, I will cite only one area where I think they underplay a technical issue. When discussing when we will be able to be certain that the climate is changing, the authors calculate that the 15-25% carbon dioxide increase over the last century should have led to a temperature rise of "about 0.2-0.3° C," values that are a factor of two or more too low using conventional logarithmic interpolation and their projection of 2-3° C rise for a doubling of carbon dioxide concentrations. Because they expect such a low temperature rise in the last 100 years, they have not anticipated the emerging conflict arising between observations and very recent model results that are suggesting a 4° C rise for a carbon dioxide doubling.

One last admonition. Do not judge the book by its cover, its size, or its price. The cover graphic apparently portrays a portion of the Mauna Loa seasonally varying carbon dioxide record. Beneath each year's annual peak in the slowly rising record is portrayed an increasingly larger power plant, erroneously implying that seasonal variations in man-made CO₂ emissions cause the seasonal oscillation in CO₂ concentrations. The authors do not make that mistake in the text, so ignore the cover graphic. With respect to the book's size, the authors are able to cover a wide variety of processes and mechanisms including some which (e.g., marine biology and clues from CO₂ and climate records of the past) are usually skipped over in such a brief review. This is accomplished by tightly worded sentences and compact (and occasionally multi-ordinate) figures. The price is kept low by simply, but clearly, reproducing single-spaced typed pages, which gives the book an exceptionally high idea-cost ratio. For those interested in the technical aspects of the CO₂ issue, this book is well worth the commitment required to understand it.

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